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(54) **METHODS AND DEVICE FOR ESTIMATING BODY WEIGHT OR EASE OF PARTURITION OF A RUMINANT**

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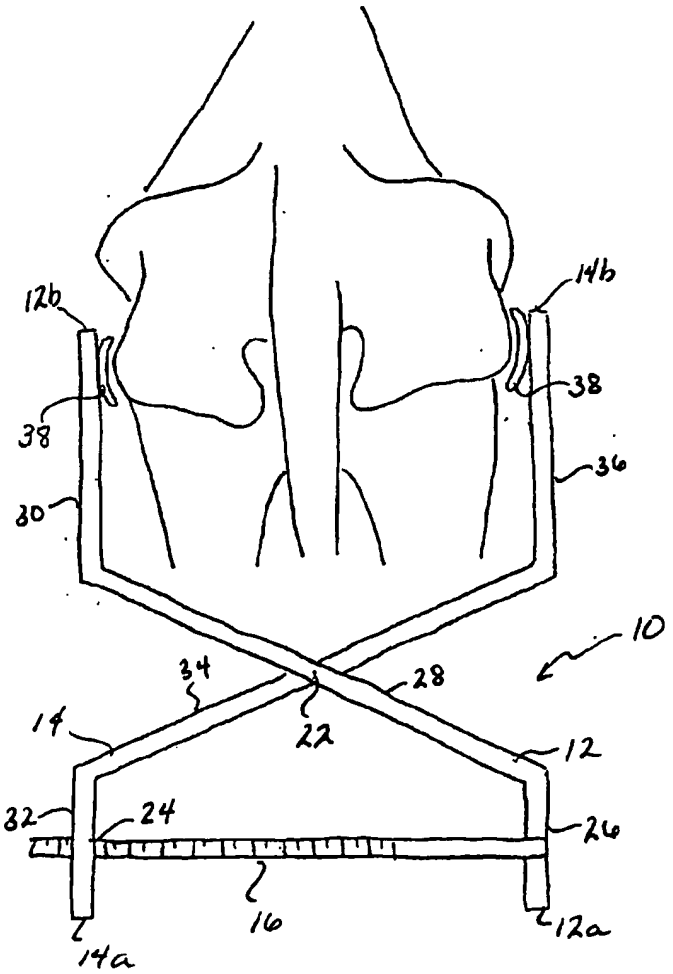
(52) **U.S. Cl.** **33/511**; 33/494

(57) **ABSTRACT**

A method for estimating a body weight of a ruminant with a skeletal structure including a cranial portion, a caudal portion, and hip joints located between the cranial and caudal portions including measuring a distance between hip joints of a ruminant and converting the measured distance to an estimated body weight of the ruminant.



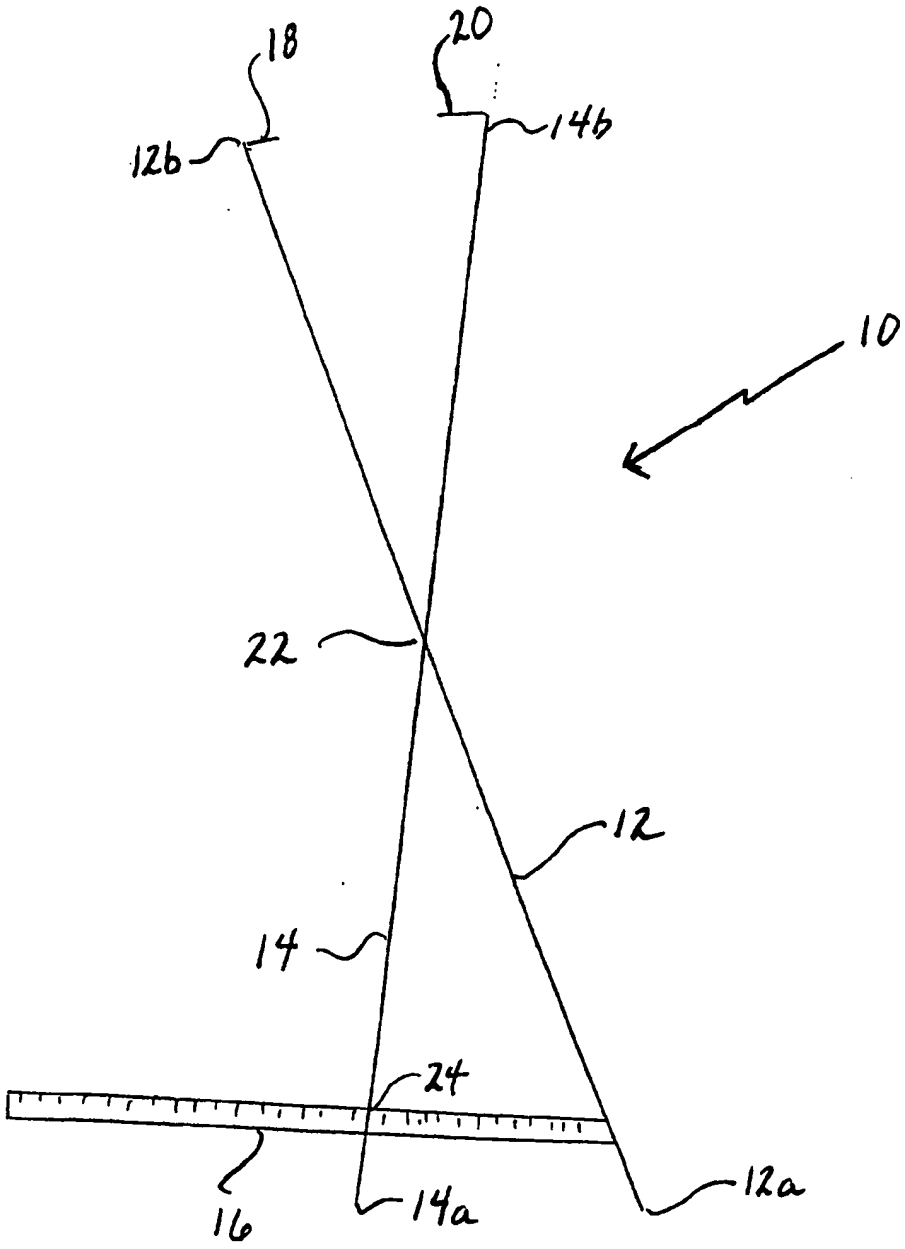


FIGURE 1

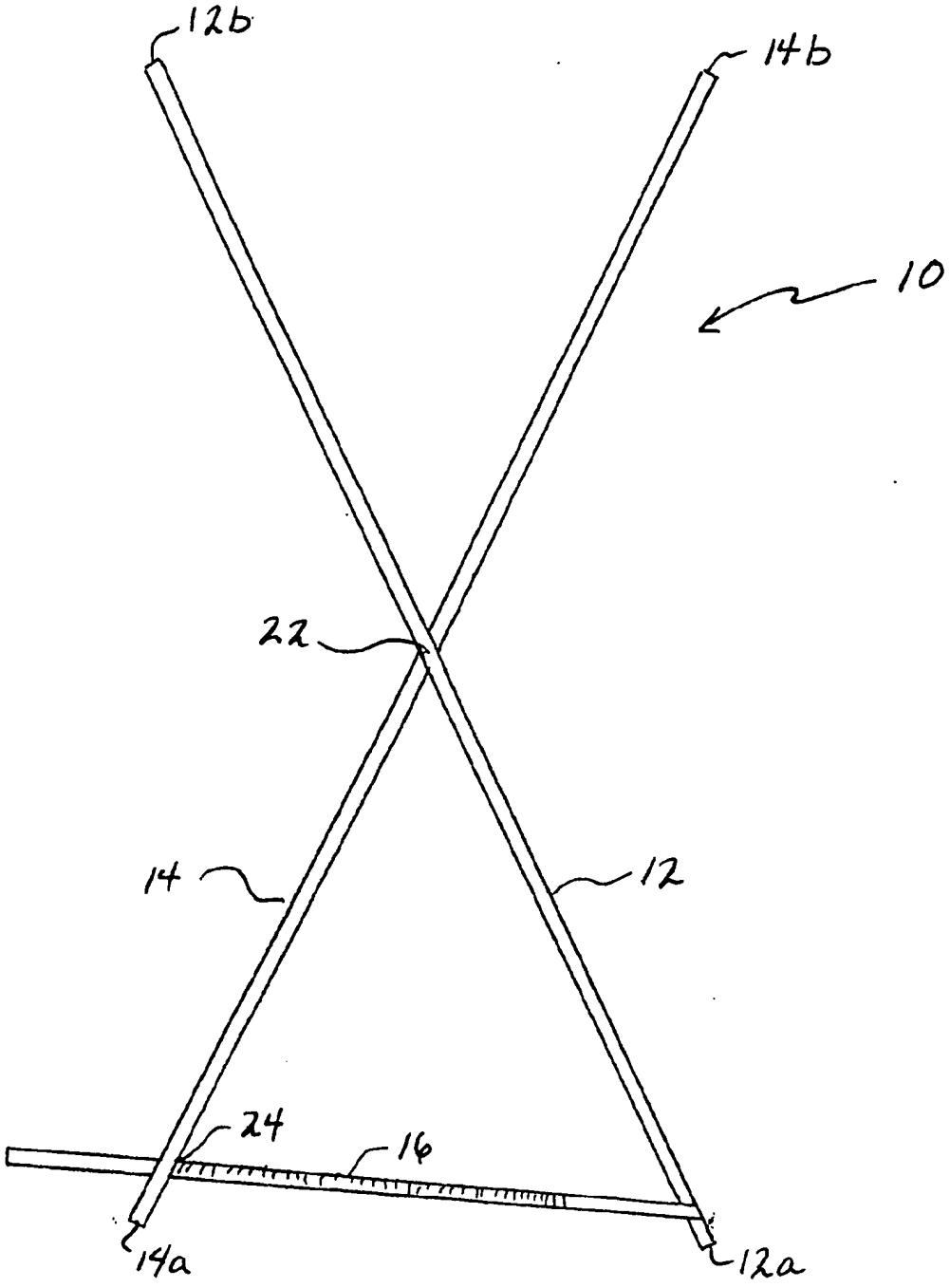


FIGURE 2

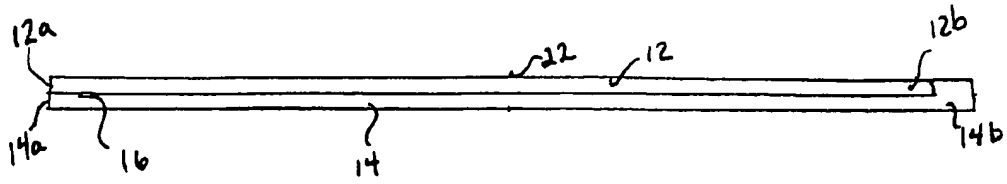


FIGURE 3

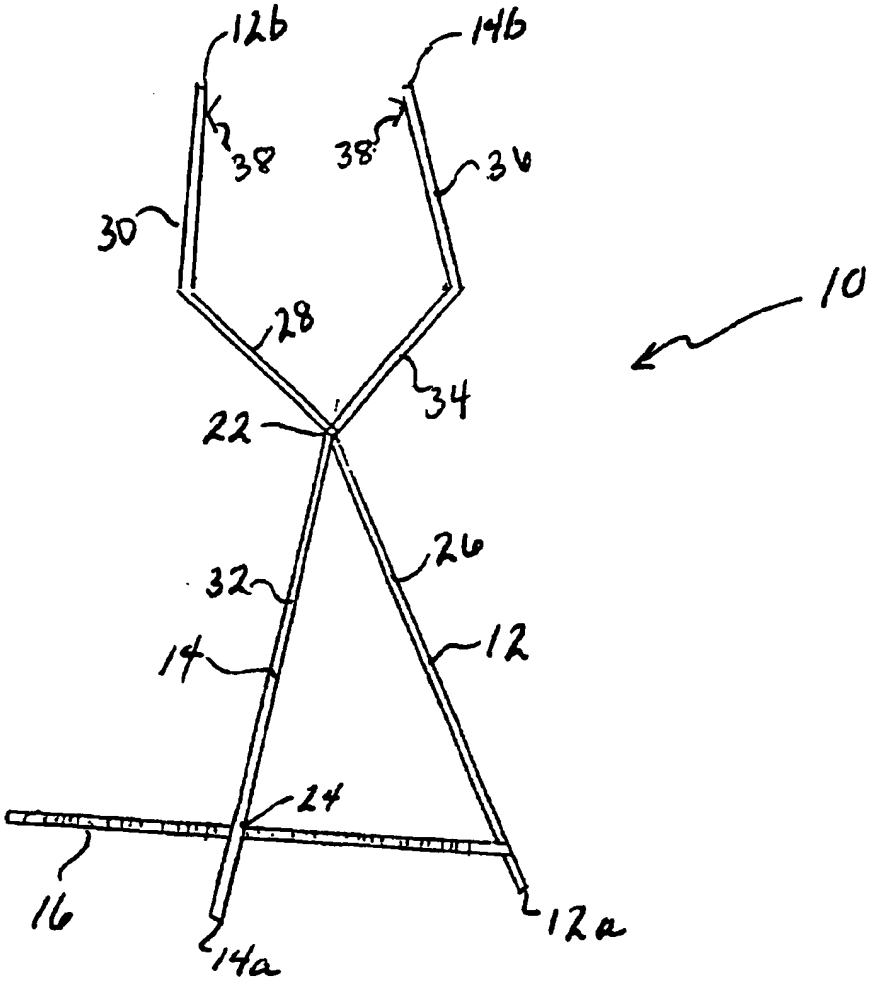


FIGURE 4

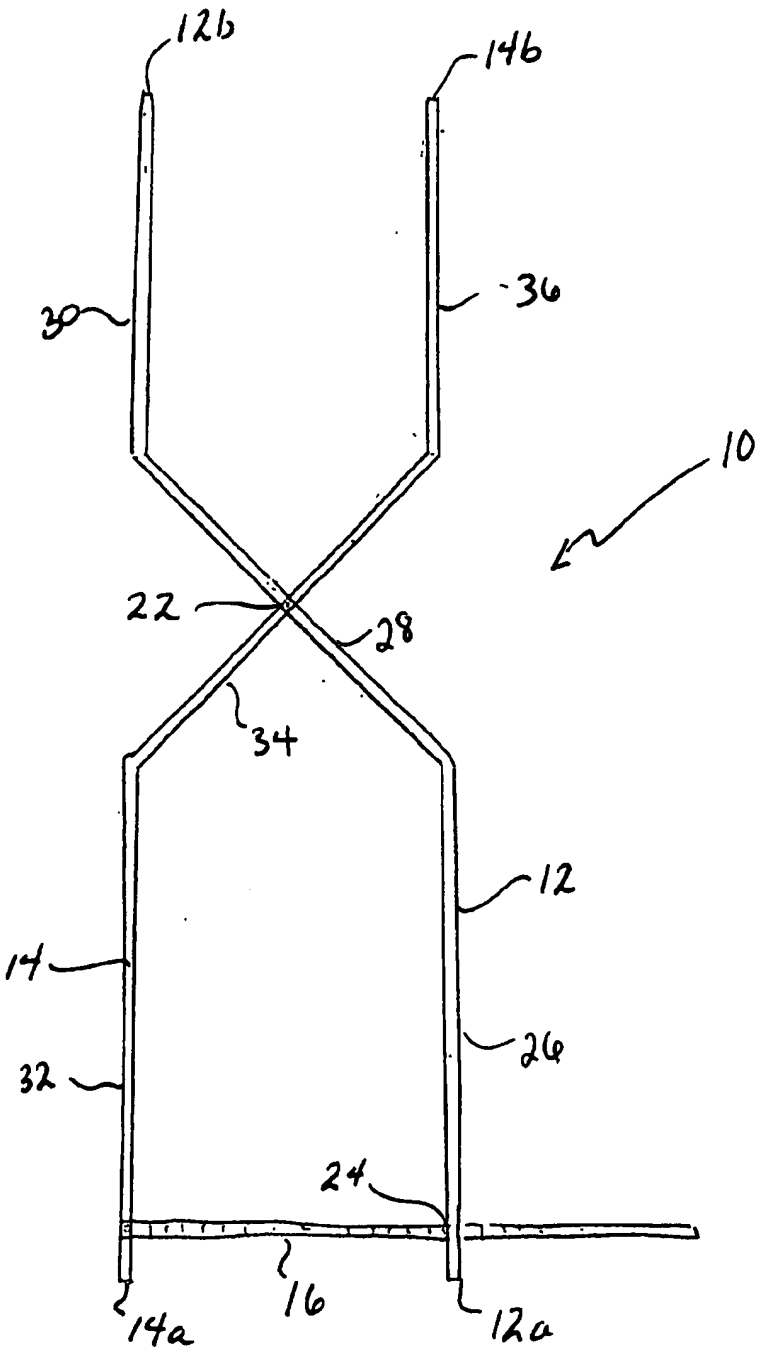


FIGURE 5

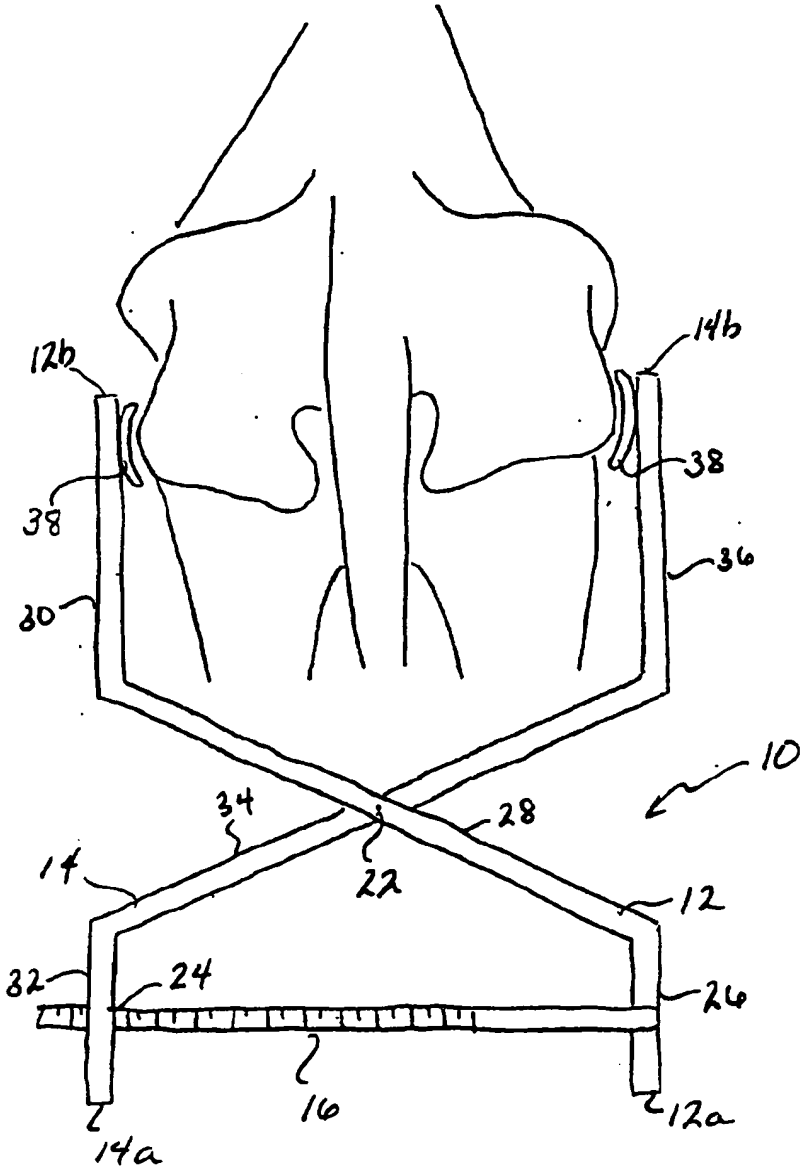


FIGURE 6A

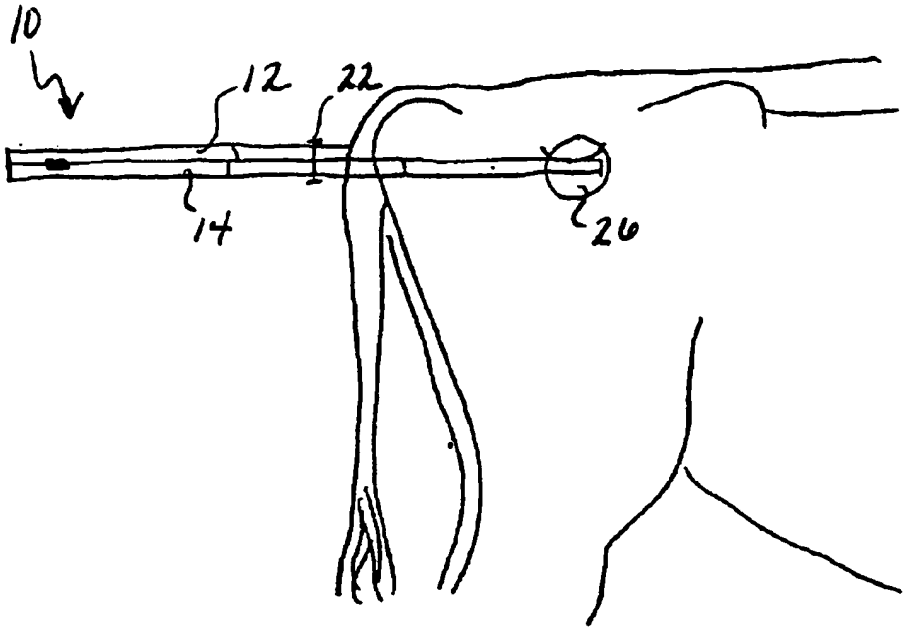


FIGURE 6B

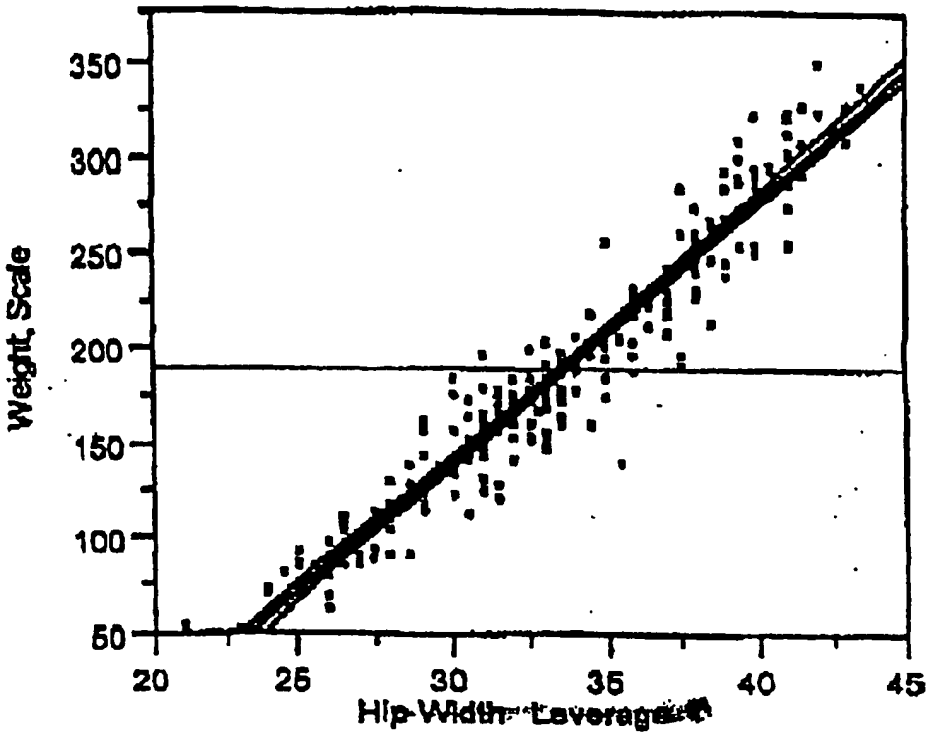

350
300
250
200
150
100
50
Weight, Scale
20
25
30
35
40
45
Hip Width Leverage

FIGURE 7

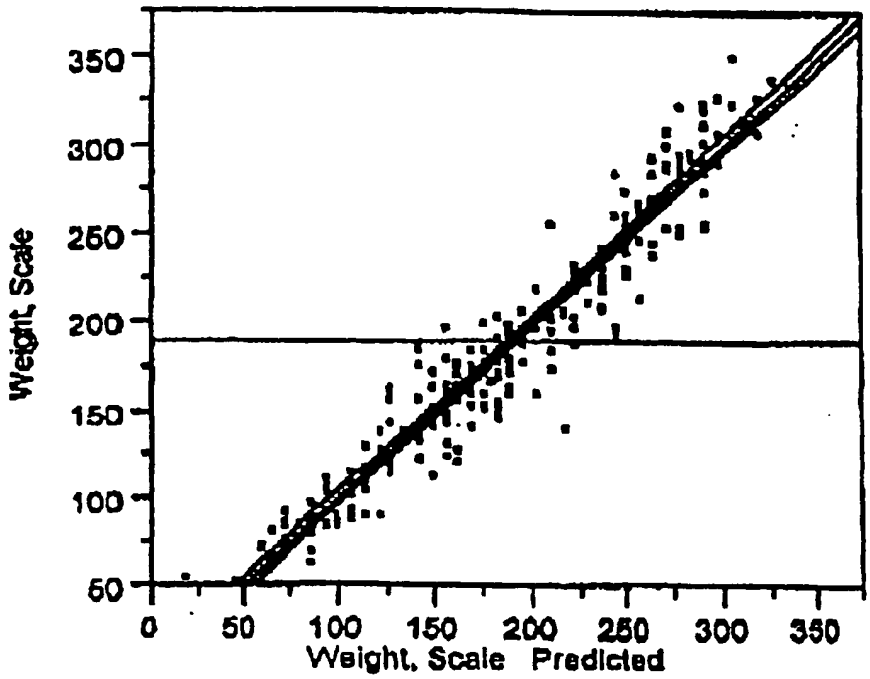

350
300
250
200
150
100
50
Weight, Scale
0
50
100
150
200
250
300
350
Weight, Scale Predicted

FIGURE 8

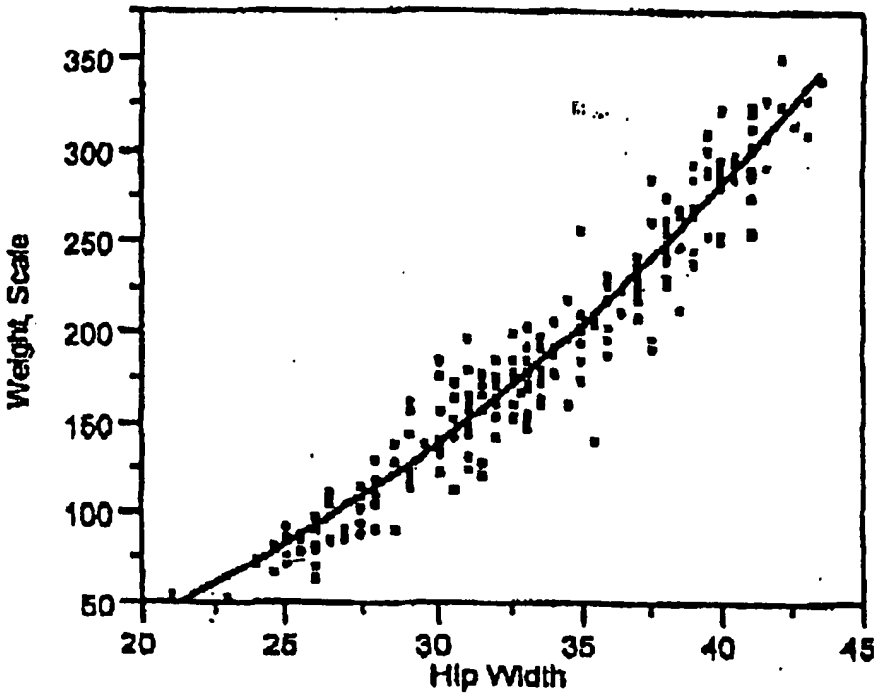

350
300
250
200
150
100
50
Weight, Scale
20
25
30
35
40
45
Hip Width

FIGURE 9

METHODS AND DEVICE FOR ESTIMATING BODY WEIGHT OR EASE OF PARTURITION OF A RUMINANT

[0001] The present invention claims the benefit of U.S. Provisional Patent Application Ser. No. 60/213,332, filed Jun. 22, 2000, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to methods for estimating a body weight of a ruminant, methods for estimating ease of parturition of a ruminant, and an apparatus for estimating a body weight or ease of parturition of a ruminant.

BACKGROUND OF THE INVENTION

[0003] Those raising dairy heifers strive to raise heifers of an adequate size to produce calves at between about 22 and 24 months, with acceptable levels of milk production. Calving age is highly correlated to the profitability of the animal, and body weight after calving is highly correlated to first lactation milk production. It is necessary to provide proper nutrition and feeding management so that heifers are large enough to breed at 13 to 15 months old in order to reach these goals.

[0004] Accordingly, it is desirable for those raising dairy heifers to be able to accurately evaluate their heifer-rearing program by monitoring the height and weight of calves and heifers and comparing the results against breed averages for a specific age group. However, it is difficult to visually determine whether a heifer or calf is of normal height and/or weight for her age. In addition, few diary raisers have complete restraint and handling systems or animal scales to determine body weights. Therefore, techniques for estimating body weight from other body measurements are needed.

[0005] Several techniques have been developed to estimate a diary animal's body weight, including heart girth measurements, withers height measurements, hip height measurements, body length measurements, and hip width measurements. Heart girth measurements are made by pulling a weight tape around the heart girth just behind the front legs and shoulder blades and are accurate to within 5-7% of the actual body weight (see, e.g., Heinrichs et al., *Monitoring Dairy Heifer Growth*, Pennsylvania State University (1998)). Withers height measurements and hip height measurements are made using a measuring stick to measure the animal at the highest point of the withers and the highest point of the hips, respectively (see, e.g., Heinrichs et al., *Monitoring Dairy Heifer Growth*, Pennsylvania State University (1998)). Body length measurements are made by placing a measuring tape along the length of the animal's body, with the animal straight and with its head held forward and upright (see, e.g., Heinrichs et al., *Monitoring Dairy Heifer Growth*, Pennsylvania State University (1998)). Hip width measurements are made using calipers which are placed against the widest part of the hip bone—the tuber coxi (see, e.g., Heinrichs et al., *Monitoring Dairy Heifer Growth*, Pennsylvania State University (1998)). However, in all of the above techniques, significant animal restraint and handling is needed to measure the animal, particularly when making measurements at positions that are difficult to reach, such as the tuber coxi. In addition, for heart girth measurements, withers height measurements, and body length measurements, the animal must be restrained in a particular position. Further, in all of the above techniques, those measuring the animal must be in close proximity to the animal, thus increasing the risk of injury. Moreover, in the above techniques the devices used for making the desired measurements are difficult to operate, leading to decreased accuracy in the obtained measurements.

[0006] In addition, it is desirable for those raising dairy heifers to be able to accurately estimate the ease of parturition or calving for the heifers. Such estimates are typically made by measuring the internal area of the birth canal. However, as above, significant animal restraint and handling is needed to make these measurements.

SUMMARY OF THE INVENTION

[0007] The present invention relates to a method for estimating a body weight of a ruminant with a skeletal structure including a cranial portion, a caudal portion, and hip joints located between the cranial and caudal portions. The method includes measuring a distance between hip joints of a ruminant and converting the measured distance to an estimated body weight of the ruminant.

[0008] The present invention also relates to a method for estimating ease of parturition of a ruminant with a skeletal structure including a cranial portion, a caudal portion, and hip joints located between the cranial and caudal portions. This method includes measuring a distance between hip joints of a ruminant and converting the measured distance to an estimated ease of parturition value of the ruminant.

[0009] Another aspect of the present invention relates to a method for estimating a body weight or ease of parturition of a ruminant with a skeletal structure including a cranial portion having first and second sides, a caudal portion having first and second sides, and hip joints located between the cranial and caudal portions. This method includes measuring a distance behind tuber coxi of a ruminant and between first and second sides of a caudal portion of the ruminant and converting the measured distance to an estimated body weight or ease of parturition of the ruminant.

[0010] Yet another aspect of the present invention relates to an apparatus for estimating a body weight or ease of parturition of a ruminant. The apparatus includes a first arm having proximal and distal ends, a second arm having proximal and distal ends, wherein the first and second arms are pivotally mounted to each other between the proximal and distal ends of the first and second arms, and a scale device connected to one of the first and second arms between the proximal and distal ends and overlapping the other one of the first arm and the second arm between the proximal and distal ends.

[0011] The apparatus of the present invention allows the operator to stand farther away from the animal being measured and limited animal restraint or handling is needed to operate the device, thus improving operator safety. In addition, the apparatus is faster and easier to operate than prior art devices, again improving operator safety. The method and apparatus of the present invention can be used to estimate ease of parturition or calving. In addition, the apparatus of the present invention allows more accurate measurement of body weight and ease of parturition, because the improved ease of use of the apparatus results in more accurate measurements of pelvic widths, thus leading to more accurate estimates of body weight and ease of parturition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] **FIG. 1** is a top view of an apparatus for estimating body weight or ease of parturition in accordance with one embodiment of the present invention;

[0013] **FIG. 2** is a top view of an apparatus for estimating body weight or ease of parturition in accordance with a second embodiment of the present invention;

[0014] **FIG. 3** is a side view of the apparatus of **FIG. 2**;

[0015] **FIG. 4** is a top view of an apparatus for estimating body weight or ease of parturition in accordance with a third embodiment of the present invention;

[0016] **FIG. 5** is a top view of an apparatus for estimating body weight or ease of parturition in accordance with a fourth embodiment of the present invention;

[0017] **FIGS. 6A and B** show the use of an apparatus for estimating body weight or ease of parturition in accordance with the present invention;

[0018] **FIG. 7** is a leverage plot for the effect of pelvic width of Holstein heifers;

[0019] **FIG. 8** is a whole-model leverage plot of the observed weight (kg) of Holstein heifers versus their predicted weight (kg) by pelvic width; and

[0020] **FIG. 9** is a graph showing the relationship of pelvic width (cm) to scale weight (kg) for Holstein heifers.

DETAILED DESCRIPTION OF THE INVENTION

[0021] An apparatus **10** for estimating body weight or ease of parturition of a ruminant in accordance with one embodiment of the present invention is shown in **FIG. 1**. The apparatus includes a first arm **12**, a second arm **14**, and a scale device **16**. Advantages of the apparatus **10** of the present invention include improved operator safety and ease in manufacturing and use. In addition, the apparatus of the present invention allows more accurate measurement of body weight and ease of parturition.

[0022] Referring to **FIG. 1**, the apparatus **10** includes a first arm **12**. The first arm **12** has a proximal end **12***a* and a distal end **12***b*. In this particular embodiment, first arm **12** is substantially straight. The first arm **12** is typically rectangular in cross section, however, other shapes, such as elongated cylinders, can be used. Further, the first arm **12** is typically about 0.75 to about 1 inch in thickness (or diameter), although other dimensions may be used. The first arm **12** is typically from about 35 inches to about 40 inches in length, which allows the user to maintain a safe distance from a ruminant when using the apparatus **10** of the present invention. However, the first arm **12** may be of any suitable length, based on the size of the ruminant. In particular, the larger the ruminant to be measured, the longer the arm length.

[0023] In the embodiment shown in **FIG. 1**, the first arm **12** includes at its distal end **12***b* a contacting portion **18** extending substantially perpendicularly from the first arm **12**. The contacting portion **18** makes contact with the ruminant for which an estimate of body weight or ease of parturition is desired. The contacting portion **18** may be integrated with or attached to the first arm **12**. Suitable attachment mechanisms include, for example, rivets, bolts, and adhesives.

[0024] Also, in this particular embodiment, the first arm **12** is made of a rigid material. Use of a rigid material allows the apparatus to be extremely sturdy which, in turn, produces more accurate measurements. In this particular embodiment, the first arm **12** is made of hardwood, such as maple or oak. Other suitable rigid materials include other woods, metals, and hard plastics.

[0025] The apparatus **10** of **FIG. 1** also includes a second arm **14**. The second arm **14** includes a proximal end **14***a* and a distal end **14***b*. The second arm **14** is substantially straight and is typically rectangular in cross section, however, other shapes, such as elongated cylinders, can be used. In addition, the second arm **14** is typically about 0.75 to about 1 inch in thickness (or diameter), although other dimensions may be used. The second arm **14** is typically from about 35 inches to about 40 inches in length, and may be the same length as the first arm **12**.

[0026] In the embodiment shown in **FIG. 1**, the second arm **14** includes at its distal end **14***b* a contacting portion **20** extending substantially perpendicularly from the first arm **12**. The contacting portion **20** makes contact with the ruminant for which an estimate of body weight or ease of parturition is desired. The contacting portion **20** may be integrated with or attached to the second arm **14**. Suitable attachment mechanisms include, for example, rivets, bolts, and adhesives.

[0027] The second arm **14** is made of a rigid material, such as maple or oak. Other variations of rigid material include other woods, metals, and hard plastics.

[0028] As shown in **FIG. 1**, the first arm **12** and the second arm **14** are pivotally mounted to each other at a location **22** between their proximal ends **12***a* and **14***a* and their distal ends **12***b* and **14***b*. In this particular embodiment, the first arm **12** and the second arm **14** are pivotally mounted to each other approximately half way between their proximal ends **12***a* and **14***a* and their distal ends **12***b* and **14***b*, although other locations of mounting may be used. Suitable devices for pivotally mounting the first arm **12** and the second arm **14** include, but are not limited to, a rivet or bolt, which allow movement and form a scissor-type action.

[0029] Referring to **FIG. 1**, the apparatus **10** further includes a scale device **16**. In this particular embodiment, the scale device **16** is attached to the first arm **12**, although the scale device may alternatively be attached to the second arm **14**. The scale device **16** is attached to the first arm **12** at a position between the proximal end **12***a* and the distal end **12***b*. As shown in **FIG. 1**, in this particular embodiment, the scale device **16** is attached to the first arm **12** between the location **22** where the first arm **12** and second arm **14** are pivotally mounted to each other and the proximal end **12***a*, near the proximal end **12***a*. In accordance with this embodiment of the present invention, the scale device **16** is pivotally attached to the first arm **12** with, for example, a rivet or bolt, although other attachment mechanisms may be used. When rotated to a suitable position, the scale device **16** overlaps the second arm **14** at position **24**. The scale device **16** includes markings which can be etched into or painted, printed, or written onto the scale device. The scale device **16** markings may be pounds, kilograms, centimeters, inches, combinations thereof, or any other suitable measurement.

[0030] The scale device **16** is made of a rigid material, such as a hardwood. Other variations of rigid material include metals and hard plastics.

[0031] Although not shown in **FIG. 1**, a guide or scale reader may be attached to the second arm **14**, such that the scale device **16** slides through the guide and the guide forms a reference point to read the scale device **16**. When the guide is present, the scale device **16** is of appropriate dimensions to fit within the guide.

[0032] In addition, the proximal ends **12***a* and **14***a* of the first arm **12** and the second arm **14**, respectively, may also include a handle. The handle may be integrated with or attached to the proximal ends **12***a* and **14***a*. Suitable attachment mechanisms include, for example, rivets, bolts, and adhesives.

[0033] An apparatus **10** in accordance with a second embodiment of the present invention is shown in **FIGS. 2 and 3**. In this embodiment, the apparatus **10** is identical to the above-described apparatus except that it does not include contacting portions **18** and **20** at the distal ends **12***b* and **14***b* of the first arm **12** and the second arm **14**, respectively. Thus, in accordance with this second embodiment of the present invention, the distal ends **12***b* and **14***b* of the first arm **12** and the second arm **14**, respectively, are used to contact a ruminant.

[0034] An apparatus **10** in accordance with a third embodiment of the present invention is shown in **FIG. 4**. The apparatus **10** in accordance with this embodiment of the invention is identical to the previous embodiments, except as described below.

[0035] Referring to **FIG. 4**, in this particular example the first arm **12** and the second arm **14** are configured to include three sections: a proximal section, an intermediate section, and a distal section. The proximal section (**26** and **32**, respectively) of the first and second arms extends from the proximal ends **12***a* and **14***a*, respectively, to the point **22** where the first arm **12** and the second arm **14** are attached. The portion of the first arm **12** and the second arm **14** between the pivot point **22** and their distal ends **12***b* and **14***b*, respectively, is configured in two sections (i.e., the intermediate section and the distal section) to form the two identical sides of an isosceles triangle. In particular, one end of the proximal section (**26** and **32**, respectively) is attached to a first end of the intermediate section (**28** and **34**, respectively) at an angle of from about 155° to about 165°, and the second end of the intermediate section (**28** and **34**, respectively) is attached to a first end of the distal section (**30** and **36**, respectively) at an angle of from about 135° to about 145°, although other dimensions may be used. The length of the first section (**26** and **32**, respectively) may be the same as or different than the length of the second (**28** and **34**, respectively) and third (**30** and **36**, respectively) sections. This configuration allows the device to be more easily placed on the desired location of a ruminant in order to estimate body weight or ease of parturition. In particular, this configuration allows the length of the first arm **12** and the second arm **14** to be shortened (while keeping the user at a safe distance), thus improving ease of use.

[0036] In addition, the distal ends **12***a* and **14***a* of the first arm **12** and the second arm **14**, respectively, include convex devices **38** to guide the user to the correct anatomical location (contact point) for measurement, although other shapes may be used. The convex devices **38** are typically about 2 inches in diameter, although other dimensions may be used. The convex devices **38** may be integrated with or attached to the first and second arms. Suitable attachment mechanisms include, for example, rivets, bolts, and adhesives.

[0037] An apparatus **10** in accordance with a fourth embodiment of the present invention is shown in **FIG. 5**. The apparatus **10** in accordance with this embodiment of the invention is identical to the previous embodiments, except as described below.

[0038] Referring to **FIG. 5**, the scale device **16** is attached to the second arm **14** and overlaps the first arm **12**. In addition, the first arm **12** and the second arm **14** are configured as "stretched out Z" shaped arm pieces, so that in the position shown in **FIG. 5** (i.e., where the proximal sections of the first and second arms are held parallel), the proximal (**12***a* and **14***a*) and distal (**12***b* and **14***b*) ends of the first and second arms remain linearly aligned. In particular, in the embodiment shown in **FIG. 5**, the first arm **12** and second arm **14** comprise three sections: a proximal section, an intermediate section, and a distal section. One end of the proximal section (**26** and **32**, respectively) is attached to a first end of the intermediate section (**28** and **34**, respectively) at an angle of from about 150° to about 160°. The intermediate section **28** of the first arm **12** and the intermediate section **34** of the second arm **14** intersect at pivot point **22**. The second end of the intermediate section (**28** and **34**, respectively) is attached to a first end of the distal section (**30** and **36**, respectively) at an angle of from about 150° to about 160°, wherein the angle between the proximal and intermediate sections is identical to the angle between the intermediate and distal sections. However, other dimensions may be used. The length of the three sections of the first arm **12** and the second arm **14** may be the same or different. This configuration allows the device to be easily placed on the desired location of the ruminant, and allows the length of the first arm **12** and the second arm **14** to be significantly shortened, while keeping the user at a safe distance.

[0039] The apparatus **10** of the present invention is made providing a first arm **12**, a second arm **14**, and a scale device **16**. The first arm **12** is pivotally attached to the second arm **14** so that the first and second arms function in a scissor-like manner. The first arm **12** is attached to the second arm **14** using a securing device, e.g. a rivet or bolt. Contacting portions **18** and **20**, such as those shown in **FIG. 1**, or convex devices **38**, such as those shown in **FIGS. 6A and B**, can be optionally integrated with or attached to distal portions **12***b* and **14***b* of the first and second arms. In addition, handles are optionally integrated with or attached to the proximal ends **12***a* and **14***a* of the first and second arms. Before or after the first and second arms are attached, the scale device **16** is pivotally attached near the proximal end of one of the first arm **12** or the second arm **14**, so that it overlaps the other of the first arm **12** or the second arm **14**.

[0040] The use of the apparatus **10** of the present invention will now be described in detail. In use, the user selects an apparatus **10** of appropriate size, based on the size of the ruminant being measured. Typically, the first arm **12**, second arm **14**, and scale device **16** will be pre-assembled into the apparatus **10**. The user then places the distal ends **12***b* and **14***b* of the first and second arms, respectively, against the first and second sides of the caudal portion of the ruminant behind the tuber coxi, as shown in **FIGS. 6A and B**. For most accurate measurement, the user places the distal ends of the first and second arms against the greater trochanters on the left and right femurs of the ruminant. If present, the contacting portions **18** and **20** or convex devices **38** on the first and second arms, respectively, are placed against the greater trochanters on the left and right femurs of the ruminant. Referring to **FIG. 6A**, the scale device **16** is then positioned so that it overlaps the arm to which it is not attached, in this particular embodiment, the second arm **14**. If a guide is present, the scale device **16** is positioned so that it slides through the guide and the guide forms a reference point to read the scale device **16**. The scale device **16** is then read by the user. The scale device **16** may provide a

measurement of width in appropriate units, or the scale device **16** may provide a converted measurement of body weight or ease of parturition. If the scale device **16** provides a measurement of width, the user then converts the width measurement to an estimate of body weight or ease of parturition.

[0041] The present invention also relates to a method for estimating body weight of a ruminant. As used herein, a ruminant is a multi-stomached animal, such as a bovine animal. Suitable bovine animals include cows, heifers, sheep, goats, calves, deer, buffalo, bison, elk, llamas, and alpacas. The ruminant includes a cranial or head portion, having first and second sides, and a caudal or tail portion, having first and second sides. Hip joints are located between the cranial and caudal portions.

[0042] In accordance with the method of the present invention, the distance between the hip joints of the ruminant is measured, as shown in **FIGS. 6A and B**. In this particular embodiment, the distance between greater trochanters of the left and right femurs of the ruminant is measured (the "pelvic width"). Distances of from about 5 cm to about 60 cm, typically, from about 20 cm to about 45 cm can be measured.

[0043] The measured distance is then converted to an estimated body weight of the ruminant. Suitable techniques for converting the measured distance to an estimated body weight include reading the measured distance and reading a weight assigned to the measured distance to estimate the body weight. Such body weights may be provided in a table or on a scale device. Body weights of from about 2 kg to about 750 kg, typically, from about 50 kg to about 355 kg can be estimated using the method of the present invention.

[0044] In accordance with the present invention, the pelvic width is a significant predictor of body weight. In particular, at least about 93% of the variation in body weight can be explained by pelvic width.

[0045] The present invention also relates to a method for estimating ease of parturition of a ruminant. This method of the present invention includes measuring a distance between hip joints of a ruminant and converting the measured distance to an estimated ease of parturition. As shown in **FIGS. 6A and B**, the step of measuring includes measuring the distance between the greater trochanters on the left and right femurs of the ruminant. In this particular embodiment, the step of converting includes reading the measured distance and reading an ease of parturition value assigned to the measured distance to estimate the ease of parturition. Such ease of parturition values may be provided in a table or on a scale device.

[0046] Another aspect of the present invention relates to a method for estimating a body weight or ease of parturition of a ruminant with a skeletal structure including a cranial portion having first and second sides, a caudal portion having first and second sides, and hip joints located between the cranial and caudal portions. This method includes measuring a distance behind tuber coxi of a ruminant (i.e., between the tuber coxi and the tail of the ruminant) and between first and second sides of a caudal portion of the ruminant and converting the measured distance to an estimated body weight or ease of parturition of the ruminant.

EXAMPLES

Example 1

Measurement of Pelvic Width to Estimate Body Weight

[0047] The distance between greater trochanters on the left and right femurs (i.e. pelvic width) was measured on 240 Holstein heifers. Pelvic widths were measured to the nearest 0.5 cm. Body weights of the heifers were recorded with electronic scales at the same time pelvic widths were measured. Body weights of the 240 heifers ranged from about 55 kg to about 355 kg. Pelvic widths ranged from about 21.0 cm to about 43.5 cm.

[0048] A linear model, least square means analysis was conducted on the obtained data, with the results shown in Tables 1-5, below.

TABLE 1

Summary of Fit

RSquare	0.927661
RSquare Adj.	0.927358
Root Mean Square Error	19.471
Mean of Response	189.6949
Observations (or Sum Wgts)	240

[0049]

TABLE 2

Lack of Fit

Source	DF	Sum of Squares	Mean Square	F Ratio
Lack of Fit	41	21044.406	513.276	1.4615
Pure Error	197	69186.100	351.198	Prob > F
Total Error	238	90230.507		0.0469
				Max RSq
				0.9445

[0050]

TABLE 3

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob > |t|
Intercept	-271.437	8.441025	-32.16	<0.0001
Hip Width	13.751876	0.248922	55.25	<0.0001

[0051]

TABLE 4

Effect Test

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Hip width	1	1	1157106.3	3052.086	<0.0001

[0052]

TABLE 5

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1157106.3	1157106	3052.086
Error	238	90230.5	379	Prob > F
C Total	239	1247336.8		<0.0001

[0053] As shown in the above tables, the pelvic width measurement was a significant predictor of body weight (P<0.0001). In particular, the correlation between pelvic width and body weight was about 93% (R^2=0.927). The pelvic width and body weight had a linear relationship within the weight range represented by this data set.

[0054] A leverage plot for the effect of pelvic width of Holstein heifers (**FIG. 7**) and a whole model leverage plot (**FIG. 8**) were produced based on the above analysis. These plots further indicated that pelvic width could be used to predict body weight, since the confidence curves in the plots crossed the horizontal line.

[0055] A quadratic term was added to the model and the correlation between hip width and body weight increased only slightly (R^2=0.934), as shown in Tables 6-8, below (scale weight=−28.383−1.12711 hip width+0.22252 hip width^2).

TABLE 6

Summary of Fit

RSquare	0.934399
RSquare Adj.	0.933845
Root Mean Square Error	18.58116
Mean of Response	189.6949
Observations (or Sum Wgts)	240

[0056]

TABLE 7

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	1165510.3	582755	1687.876
Error	237	81826.5	345	Prob > F
C Total	239	1247336.8		<0.0001

[0057]

TABLE 8

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob > |t|	Lower 95%	Upper 95%
Intercept	-28.38331	49.91851	-0.57	-0.5702	-126.7252	69.958584
Hip Width	-1.127112	3.025146	-0.37	0.7098	-7.086799	4.8325737
Hip Width^2	0.2225158	0.045101	4.93	<0.0001	0.1336637	0.3113679

[0058] The resulting graph showing hip width versus scale width is shown in **FIG. 9**.

[0059] Although preferred embodiments have been depicted and described in detail herein, it will be apparent to those skilled in the relevant art that various modifications, additions, substitutions, and the like can be made without departing from the spirit of the invention and these are therefore considered to be within the scope of the invention as defined in the claims which follow.

What is claimed is:

1. A method for estimating a body weight of a ruminant with a skeletal structure including a cranial portion, a caudal portion, and hip joints located between the cranial and caudal portions comprising:

measuring a distance between hip joints of a ruminant; and

converting the measured distance to an estimated body weight of the ruminant.

2. The method according to claim 1 wherein the step of measuring comprises measuring the distance between greater trochanters on left and right femurs of the ruminant.

3. The method according to claim 1 wherein the step of converting comprises:

reading the measured distance; and

reading a weight assigned to the measured distance to estimate the body weight.

4. The method according to claim 1 wherein the ruminant is a bovine animal.

5. The method according to claim 4 wherein the bovine animal is selected from the group consisting of cows, heifers, sheep, goats, calves, deer, buffalo, bison, elk, llamas, and alpacas.

6. A method for estimating ease of parturition of a ruminant with a skeletal structure including a cranial portion, a caudal portion, and hip joints located between the cranial and caudal portions comprising:

measuring a distance between hip joints of a ruminant; and

converting the measured distance to an estimated ease of parturition value of the ruminant.

7. The method according to claim 6 wherein the step of measuring comprises measuring the distance between greater trochanters on left and right femurs of the ruminant.

8. The method according to claim 6 wherein the step of converting comprises:

reading the measured distance; and

reading an ease of parturition value assigned to the measured distance to estimate the ease of parturition.

9. The method according to claim 6 wherein the ruminant is a bovine animal.

10. The method according to claim 9 wherein the bovine animal is selected from the group consisting of cows, heifers, sheep, goats, calves, deer, buffalo, bison, elk, llamas, and alpacas.

11. A method for estimating a body weight or ease of parturition of a ruminant with a skeletal structure including a cranial portion having first and second sides, a caudal portion having first and second sides, and hip joints located between the cranial and caudal portions comprising:

measuring a distance behind tuber coxi of a ruminant and between first and second sides of a caudal portion of the ruminant; and

converting the measured distance to an estimated body weight or ease of parturition of the ruminant.

12. The method according to claim 11 wherein the step of measuring comprises measuring the distance between greater trochanters on left and right femurs of the ruminant.

13. The method according to claim 11 wherein the step of converting comprises:

reading the measured distance; and

reading a body weight value or an ease of parturition value assigned to the measured distance to estimate the body weight or ease of parturition.

14. The method according to claim 11 wherein the ruminant is a bovine animal.

15. The method according to claim 14 wherein the bovine animal is selected from the group consisting of cows, heifers, sheep, goats, calves, deer, buffalo, bison, elk, llamas, and alpacas.

16. An apparatus for estimating a body weight or ease of parturition of a ruminant comprising:

a first arm having proximal and distal ends;

a second arm having proximal and distal ends, wherein the first and second arms are pivotally mounted to each other between the proximal and distal ends of the first and second arms; and

a scale device connected to one of the first and second arms between the proximal and distal ends and overlapping the other one of the first arm and the second arm between the proximal and distal ends.

17. The apparatus according to claim 16 wherein the scale device is connected to the one of the first and second arms at a location between where the first and second arms are pivotally mounted to each other and the proximal end of the one of the first and second arms.

18. The apparatus according to claim 16 further comprising a handle at the proximal end of the first arm and the second arm.

19. The apparatus according to claim 16 further comprising a contacting device connected to the distal end of the first arm and the second arm.

20. The apparatus according to claim 19 wherein the contacting device is a convex device.

21. The apparatus according to claim 16 wherein the first arm and the second arm are substantially straight.

22. The apparatus according to claim 16 wherein the first arm and the second arm comprise:

a proximal section;

an intermediate section; and

a distal section, wherein the proximal section is adjacent and in contact with the intermediate section and wherein the intermediate section is adjacent and in contact with the distal section.

23. The apparatus according to claim 22 wherein the proximal section and the intermediate section are connected at an angle of from about 155° to about 165° and the intermediate section and the distal section are connected at an angle of from about 135° to about 145°.

24. The apparatus according to claim 22 wherein the proximal section and the intermediate section are connected at an angle of from about 150° to about 160° and the intermediate section and the distal section are connected at an angle of from about 150° to about 160°.

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